Timing is Everything – Monitoring Plant Phenology in the Central Alaska Network

By Carl Roland

The timing of biological events in the far north are often strictly controlled by physical factors associated with climate because of extreme temperature changes during the year. This means that our changing climate will have far-reaching and profound effects on species living in the north. The timing of recurring biological events, or phenology, affects how well plants and animals reproduce. It is also a measure scientists can use to track climate change and its effects. As a result, we have incorporated measures of plant phenology as an important component of our long term vegetation monitoring program.

The growing season is relatively short in central Alaska. It begins when the sun rises high enough in the sky to warm the air sufficiently to melt the snowpack, which allows soils to thaw so that plants can take up water and nutrients. Alpine areas often melt later, delaying spring onset. The growing season ends when day-length and temperature dwindles in the fall and freezing temperatures become a daily occurrence. However, wetland sites may experience plant growth later in the year because wet soils store heat and there is a reduced influence of late summer drought.

We began monitoring yearly phenology of aspen (*Populus tremuloides*) in Denali National Park and Preserve in 2005. In 2008 we included sites at Eagle on the Yukon River and at Copper Center in southcentral Alaska (*Figure 1*). Our methodology uses park staff to collect the data, and sampling plots are located close to visitor centers at each park so visitors can assist with data collection. Our goal is to detect changes in the timing of key events in the life cycle of aspen in relation to climate. We chose aspen because it is widely distributed and monitored in other national and international phenology networks. This means our results may be examined in regional, continental and global contexts. Because it is likely that the phenology of aspen is similar to many others, this data will provide insight on an important ecosystem attribute applicable to many species. Over time, these data will allow us, for example, to compare broad trends in "average" phenology like the date at which 100% of the trees at Denali Park, Eagle and Copper Center have experienced bud burst (*Figure 2*).

At present we have five years of data from Denali and two years from Eagle and Copper Center. We are already learning that phenology of aspen trees is different among the three sampling sites, and this reflects the different climate the trees experience (*Figure 2*). We are excited by these results because they confirm our initial assessment that aspen was an appropriate species to use for tracking the response of plants to climate change. We invite interested people from across Alaska to take part in this program by setting up an aspen phenology plot in your community. To do so, please contact Carl Roland carl_roland@nps.gov for more details.

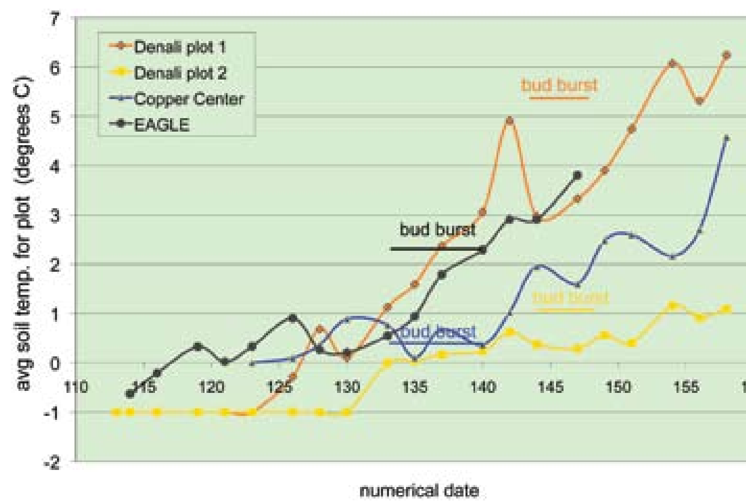

Figure 1. Map of southcentral and eastern interior Alaska showing the locations where aspen phenology observations are recorded for the Central Alaska Network program. Phenology monitoring stations are shown in blue.

Figure 2. Graph showing the mean soil temperatures recorded at four aspen phenology monitoring plots during the early season of 2008 (including the period April 22 through May 31). The horizontal lines show the approximate period for bud burst of aspen trees in these plots, spanning the date of first bud bust until leaves are unfurled in 100% of trees in plot.